CLAIMS

We claim:

1. A computer implemented method comprising:

selecting an updated set of attributes in a routing table before selecting a set of updated destinations associated with the selected set of attributes; and

generating an update message that includes the set of updated destinations for the set of attributes.

2. The computer implemented method of claim 1 wherein the routing table includes a destination data structure that includes the set of updated destinations, a set of path data structures, and an attribute data structure that includes an entry indicating the updated set of attributes.

3. The computer implemented method of claim 2 wherein the destination data structure is a radix trie.

4. The computer implemented method of claim 2 wherein the destination data structure is a hash table.

5. The computer implemented method of claim 1 wherein the updated set of attributes reference the set of updated destinations.

6. The computer implemented method of claim 1 wherein the set of set of updated destinations is a linked list and the updated set of attributes reference the linked list's head.

7. 6. The computer implemented method of claim 1 wherein the set of set of updated destinations is a linked list and the updated set of attributes reference the linked list's head and tail.

8. The computer implemented method of claim 1 further comprising:
a selecting a dummy attribute before selecting a second set of updated destinations; and
generating a second update message indicating the second set of updated destinations as unreachable.

9. A computer implemented method comprising:
selecting a first data structure, the first data structure corresponding to a best path to a destination;
referencing a first element of a second data structure from the selected first data structure, the first element indicating a set of attributes of the best path; and
referencing a second element of a third data structure from the first element, the second element indicating the destination.

10. The computer implemented method of claim 9 further comprising:
selecting the first element in the second data structure;
tracing a chain of elements of the third data structure from the selected first element;
creating an update message, the network update message indicating the set of attributes;
indicating a set of destinations that are indicated by the chain of elements in the update message; and
transmitting the network update message.

11. The computer implemented method of claim 9 further comprising:
determining a second destination to be unreachable; and
referencing a third element of the third data structure from a dummy element of the second data structure, the third element indicating the second destination.

12. The computer implemented method of claim 9 wherein the second data structure is a hash table.

13. The computer implemented method of claim 9 wherein the third data structure is a radix trie.

14. A network device comprising:

a memory to host a routing table, the routing table to include a first data structure to indicate a set of destinations and a second data structure to indicate a set of attributes; and

a set of one or more processors coupled with the memory, the set of processors to process a network update message that indicates one of the set of destinations and a subset of the set of attributes and to insert the one of the set of destinations into a chain of elements of the first data structure in accordance with the network update message, the chain to be referenced by an element of the second data structure that indicates the subset of the set of attributes.

15. The network device of claim 14 wherein the first data structure is a radix trie.

16. The network device of claim 14 wherein the second data structure is a hash table.

17. The network device of claim 14 further comprising the set of processors to insert a second element of the first data structure into a second attribute-oriented chain that is referenced by a dummy element of the second data structure.

18. The network device of claim 14 further comprising the set of processors to trace the attributed oriented chain of elements, to generate a second network update message, and to indicate a subset of the set of destinations in the second network update message, the subset of destinations indicated by the attribute-oriented chain of elements.

19. A network device comprising:

a line card to receive an update message that indicates a destination and a set of attributes; and

a control card coupled with the line card, the control card to host a routing table, the routing table to include a first data structure to indicate a set of destinations and a second data structure to indicate a plurality of attributes, the control card to process the update message and to insert the destinations into a chain of elements of the first data structure in accordance with the update message, the chain to be referenced by an element of the second data structure, the element of the second data structure to indicate the set of attributes.

20. The network device of claim 19 wherein the first data structure is a radix trie.

21. The network device of claim 19 wherein the second data structure is a hash table.

22. The network device of claim 19 further comprising:

the line card to receive an unreachability update message indicating a second destination; and

the control card to process the unreachability update message, to select a second element of the first data structure that indicates the second destination and to insert the selected second element into a dummy attribute-oriented chain.

23. The network device of claim 19 further comprising the control card to trace the chain of elements, to generate a second network update message, and to indicate a subset of the set of destinations in the second network update message, the subset of destinations indicated by the chain of elements.

24. A system comprising:

a first network device to transmit an update message that indicates a destination and a first set of attributes that describes a path; and

a second network device coupled with the first network device, the second network device to host a routing table that includes a first data structure that indicates destinations and a second data structure that indicates attributes, to receive the update message, to reference a first element of the first data structure that indicates the destination from a second element of the second data structure, the second element of the second data structure indicating the set of attributes.

25. The system of claim 24 further comprising the second network device to select the second element of the second data structure, to trace an attribute-oriented chain of elements from the second element, the attribute-oriented chain of elements including the first element, to create a second update message, to identify the set of attributes and a set of destinations in the second update message, the set of attributes indicated by the second element and the set of destinations indicated by the attribute-oriented chain of elements, and to transmit the second update message.

26. The system of claim 24 further comprising:

the first network device to transmit a withdraw message, the withdraw message indicating a second destination as unreachable; and

the second network device to receive the withdraw message and to insert a fourth element of the first data structure into a attribute-oriented referenced by a dummy element of the second data structure, the fourth element to indicate the second destination.

27. The system of claim 24 wherein the first data structure is a radix trie.

28. The system of claim 24 wherein the second data structure is a hash table.

29. A machine readable medium, which when executed by a set of one or more processors, cause said set of processors to perform operations comprising:

selecting an updated set of attributes in a routing table before selecting a set of updated destinations associated with the selected set of attributes; and

generating an update message that includes the set of updated destinations for the set of attributes.

30. The machine readable medium of claim 29 wherein the routing table includes a destination data structure that includes the set of updated destinations, a set of path data structures, and an attribute data structure that includes an entry indicating the updated set of attributes.

31. The machine readable medium of claim 30 wherein the destination data structure is a radix trie.

32. The machine readable medium of claim 30 wherein the destination data structure is a hash table.

33. The machine readable medium of claim 29 wherein the updated set of attributes reference the set of updated destinations.

34. The machine readable medium of claim 29 wherein the set of updated destinations is a linked list and the updated set of attributes reference the linked list's head.

35. The machine readable medium of claim 29 wherein the set of set of updated destinations is a linked list and the updated set of attributes reference the linked list's head and tail.

36. The machine readable medium of claim 29 further comprising:

a selecting a dummy attribute before selecting a second set of updated destinations; and

generating a second update message indicating the second set of updated destinations as unreachable.

37. A machine readable medium, which when executed by a set of one or more processors, cause said set of processors to perform operations comprising:

selecting a first data structure, the first data structure corresponding to a best path to a destination;

referencing a first element of a second data structure from the selected first data structure, the first element indicating a set of attributes of the best path; and

referencing a second element of a third data structure from the first element, the second element indicating the destination.

38. The machine readable medium of claim 37 further comprising:

selecting the first element in the second data structure;

tracing a chain of elements of the third data structure from the selected first element;

creating an update message, the network update message indicating the set of attributes;

indicating a set of destinations that are indicated by the chain of elements in the update message; and

transmitting the network update message.

39. The machine readable medium of claim 37 further comprising:

determining a second destination to be unreachable; and

referencing a third element of the third data structure from a dummy element of the second data structure, the third element indicating the second destination.

40. The machine readable medium of claim 37 wherein the second data structure is a hash table.

41. The machine readable medium of claim 37 wherein the third data structure is a radix trie.

42. A machine readable medium, which when executed by a set of one or more processors, cause said set of processors to perform operations comprising::

selecting an element of a first data structure that is marked, the element indicating a set of attributes;

creating a network update message;

indicating the set of attributes in the message; and

indicating a set of one or more destinations in the update message, the set of destinations indicated by a set of linked elements of a second data structure, the element of the first data structure referencing the set of linked elements.

43. The machine readable medium of claim 42 further comprising:

selecting a third data structure, the third data structure corresponding to a best path to a destination;

referencing a second element of the first data structure from the selected third data structure, the second element indicating a second set of attributes, the second set of attributes describing the best path; and

referencing a third element of the second data structure from the second element, the third element indicating the destination.

44. The machine readable medium of claim 42 further comprising:

determining a second destination to be unreachable; and

referencing a fourth element of the second data structure from a dummy element of the first data structure, the fourth element indicating the second destination.

45. The machine readable medium of claim 42 wherein the first data structure is a hash table.

46. The machine readable medium of claim 42 wherein the third data structure is a radix trie.

47. A machine-readable medium having a routing table, comprising:

a first data structure including a first field to indicate a destination, a second field to reference the first data structure, a third field to reference a second data structure;

the second data structure including a fourth field to indicate an origin and a fifth field to reference a third data structure; and

a third data structure including a set of fields to indicate a set of attributes describing a path and a sixth field to reference the first data structure.

48. The machine-readable medium of claim 47 further comprising the third data structure including a seventh field to indicate the first data structure as a tail of an attribute-oriented chain.

49. The machine-readable medium of claim 47 wherein the attribute-oriented chain is a linked list of the first data structure.